DOCUMENT RESUME

ED 461 365 IR 018 921

AUTHOR Lee, John; Dineen, Finbar; McKendree, Jean
TITLE Supporting Student Discussions: It Isn't Just Talk.
PUB DATE 1998-00-00
NOTE 12p.; IN: D. Darina and I. Stanchev, Eds. "Human Computer Interaction and Education Tools (HCI-ET)" Conference Proceedings. Sofia, Bulgaria: VirTech, Ltd. pp 124-136. Paper presented at the International Federation for Information Processing, Research on Education Applications of Information Technologies (IFIP WG 3.3) International Working Conference (Sozopol, Bulgaria, May 27-28, 1997). Research partially performed in Human Communication Research Center, UK Economic and Social Research Council.
AVAILABLE FROM For full text: http://www.hcrc.ed.ac.uk/gal/vicar/index.html
PUB TYPE Reports - Evaluative (142) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Computer Assisted Instruction; *Computer Mediated Communication; Course Content; Foreign Countries; *Group Discussion; Higher Education; Instructional Innovation; Interaction; Internet; Student Projects; Teaching Methods
IDENTIFIERS *Dialogic Communication; University of Edinburgh (Scotland)

ABSTRACT

The "Vicarious Learner" project at Glasgow Caledonian University and the University of Edinburgh is looking broadly at issues concerning the role of dialogue in learning. This paper looks at the more general question of how the value of dialogue in learning depends on the structure of the environment in which it takes place. In particular, it considers dialogue which takes place in a computer-mediated communication (CMC) environment, an approach which is being adopted in many courses from primary schools through postsecondary university courses and continuing education, often uncritically and without fully understanding all the issues which arise from these methods. As part of this project, courses are taught which require students to discuss topics using an Internet forum. The Computers in Teaching and Learning (CTL) course has been taught twice using this discussion component. Examples are given in this paper of discussion organization and content in both the CTL courses. A series of Task Directed Discussion games (TDDs) are being developed which encourage students quickly to engage in meaningful discussions early in a course. (AEF)

Reproductions supplied by EDRS are the best that can be made from the original document.

ED 461 365

Proceedings of IFIP WG 3.3 "Research on Educational Applications of Information Technologies", D. Darina and I Stanchev (Eds), Sofia, Bulgaria: VIRTECH, Ltd., pp. 124-136. ISBN: 954-9582-02-7

Supporting Student Discussions: It Isn't Just Talk

John Lee*, Finbar Dineen† and Jean McKendree†*

* HCRC, University of Edinburgh

† CLTI, Glasgow Caledonian University

Introduction

Dialogue is an essential component of learning, particularly in complex, discursive domains. This has been noted by many researchers (Ohlsson, 1996; Voss, 1996; Laurillard, 1993), but with increasing class sizes and the move toward more and more computer-based courses, this component is ever-decreasing and in danger of disappearing completely. The role of technology must be to push back the threshold imposed by these constraints, this being achieved by opening up new media for discourse that are not subject to the same delivery bottlenecks as traditional methods (OECD, 1996).

The *Vicarious Learner* project at Glasgow Caledonian University and the University of Edinburgh is looking broadly at issues concerning the role of dialogue in learning. A specific interest, and the origin of the project's name, is in the question of whether and how dialogue can be helpfully "re-used" by showing it to other learners who arrive at a problem similar to one addressed in the dialogue (McKendree et al., 1997). What benefits can students gain from dialogue as observers, not just as participants?

The present paper, however, looks at the more general question of how the value of dialogue in learning depends on the structure of the environment in which it takes place. In particular, we consider dialogue which takes place in a "computer-supported communication" (CMC) environment, an approach which is being adopted in many courses from primary schools through postgraduate university courses and continuing education, often uncritically and without fully understanding all the issues which arise from these methods.

We consider the various roles of the environment, the participants and the decisions of the course organisers as some of the determinants of the kind of dialogue that results. These issues underlie dialogue in learning, face-to-face as well as on-line (Newman et al., 1995; Scardamalia and Bereiter, 1991).

As one part of this project, we are teaching courses which require students to discuss topics using an Internet forum. The Computers in Teaching and Learning (CTL) course has been taught twice using this discussion component. We gathered interview and access data during the first running of the course and analysed the discussions for focus and content. Based on the students' comments and our own analysis of the usefulness of the discussions, we made major changes both to the interface to the course materials and to the organisation and management of the discussion forum.

We found significant differences in the interactional or HCI aspects of the course which were generally favourable after the changes. However, we also found differences in the content of the discussions and the attitudes of the students toward the discussions which were generally negative. The interface changes were typical "iterative design" improvements and will be only briefly summarised. However, the discussion differences were not as successful and are discussed in more detail.

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

BEST COPY AVAILABLE

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
J. McKendree
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

IR018921

Discussions: organisation and content

Below, we show examples of discussion organisation and content in both the CTL courses. Computer-mediated discussion took place using the "HyperNews" system (LaLiberte, 1995) -- a tool that manages a collection of HTML pages to provide a forum maintaining persistent discussion threads accessible through a normal Web browser such as Netscape. In the first Computers in Teaching and Learning course (CTL1), this environment was used relatively loosely. Students were prompted by a few seed questions, but then were left to develop the discussion as they chose, with arbitrary but usually quite sparse contributions from the course tutors. Thus HyperNews, as used in CTL1, acted as a form of 'discretionary database' (Connelly and Thorn, 1991), growing and developing only under the motivation of the students themselves.

Based on feedback from the first course and suggestions in the literature on conducting on-line discussions (Sproull and Kiesler, 1993; OECD, 1996), we made the discussions in the second CTL course more structured and participation compulsory. We had tutors post specific questions and participate more, particularly by summarising the main points at the end of each week's discussion.

These changes, which in good 'user-centred' style were based on the comments and observation of real users in a real setting were not successful in improving the discussions. Two effects were particularly striking. On the one hand, all students participated in the discussion in CTL2, whereas in CTL1 only a half of the students made any contribution, though only half of these again (i.e. a quarter of the class) on a regular basis. On the other hand, the number of questions raised in the HyperNews discussion in a given week in CTL1, was typically four times greater than in CTL2. An analysis of these questions showed those generated in CTL1 to have been 'knowledge-based' questions arising from students' interests and attempts to engage more deeply in the problems underlying the course content (Scardamalia and Bereiter, 1992). That is, they were engaging in discussion on the theoretical assumptions and motivations defining the knowledge domain. In contrast, students in CTL2 all participated, but in a generally much more subdued manner, restricting their questions to a more shallow 'text-based' level (Rosenshine and Chapman, 1990).

The following screen-captured images (Figs 1 and 2) show the general framework of a HyperNews discussion, and also indicate some of the differences between the two runs of the course. Quite noticeable is the difference in depth of nesting in the structure of the discussion, reflecting the fact that in CTL1 the students are probing the topic in much greater depth.

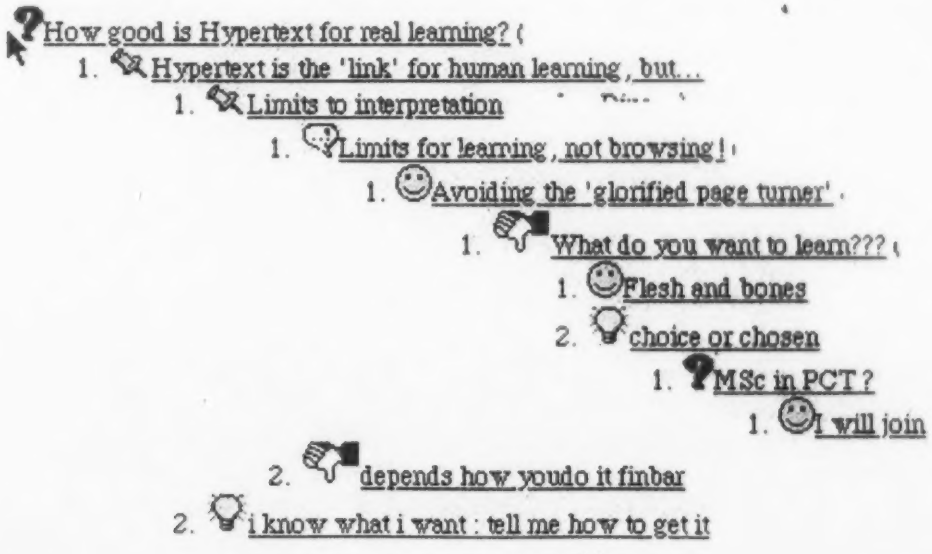
How good is Hypertext for real learning?
1. Hypertext is the 'link' for human learning , but...
1. Limits to interpretation
1. Limits for learning , not browsing !
1. Avoiding the 'glorified page turner'
1. What do you want to learn???
1. Flesh and bones
2. choice or chosen
1. MSc in PCT ?
1. I will join
2. depends how youdo it finbar
2. i know what i want : tell me how to get it

Figure 1: HyperNews discussion in CTL 1

BEST COPY AVAILABLE

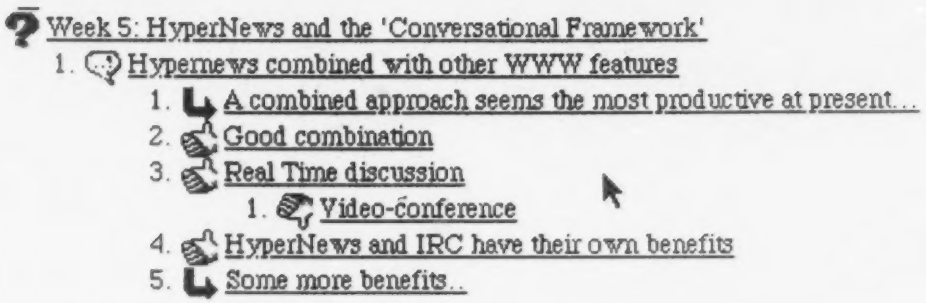
Week 5: HyperNews and the 'Conversational Framework'
1. Hypernews combined with other WWW features
1. A combined approach seems the most productive at present...
2. Good combination
3. Real Time discussion
1. Video-conference
4. HyperNews and IRC have their own benefits
5. Some more benefits..

Figure 2: HyperNews discussion in CTL 2

There were also differences in the students' perception of the discussion, as revealed through interview and questionnaire. The more structured material produced in CTL2 was seen as less interesting, and the students were somehow less engaged by the activity, as in the case of the student who commented later:

> *"Made no difference... more because you had to do it. Questions were not interesting to do, because you had to [answer them]."*

These general differences are summed up in Table 1.

CTL 1	CTL 2
Held amongst only a minority of the class	All students made submissions
Wandered from topic to topic	Students responded to questions put to them by tutors
Discussion not directly related to course content	Discussion tied to course content and lectures
Led by students' interest	Led by weekly question
Waxing and waning in participation from week to week	Participation steady, though gradually declining in volume over the semester
Discussion threads permanently 'open'	Discussion threads effectively 'closed' by the posing of a new question
Enjoyable for the passive audience to read	Not perceived as interesting material to read
Played an important social role in the course	No social function
Peer questioning taking place	Few questions asked

Table 1: CTL1/2 Course — comparisons of role of discussion forum

Thus, the analysis of the form, scope and content of the discussions arising from CTL1 and CTL2 show marked differences, though one natural question to ask is the extent to which such differences result in differences in learning outcomes. This is much more difficult to assess, though Henri (1991) suggests that simple cognitive measures of learning outcomes from computer conferencing largely miss the wider determinants of pedagogical efficacy (see also Mason, 1991). Henri suggests five measures to be taken from discourse, these being: (i) the rates of participation (gross counts of hit rate, message length etc.); (ii) social measures; (iii) scoring of the discourse interactions; (iv) a measure of cognitive outcomes from the exchanges; and (v) types of meta-cognitive discussions working alongside the core dialogue. The measures relating to the first three of these have been given above.

Motivated by Henri's (1991) and Mason's (1991) analysis of current measurement techniques for CMC and CSCL, Newman et al. (1995) have designed a content analysis mark-up scheme to provide a score for the presence of 'critical thinking' in computer mediated discussion. This score is in fact a critical thinking ratio based on the presence of positive and negative aspects within a discussion. That is, the critical thinking ratio is given by $(X^+ - X^-)/(X^+ + X^-)$, where X^+ marks the presence of a positive critical thinking factor and X^- a negative factor. The argument is that the presence of such discourse patterns both provides signs of deeper levels of processing by learners and contributes to a 'community of enquiry' from which other learners benefit.

Partial analysis of the content of the HyperNews discussions for CTL1 and CTL2 confirms the measurements produced against Henri's other criteria for effective discourse. Newman et al. distinguish between a number of different types of critical thinking, each with its own ratio measure. For CTL1 the critical thinking ratio was generally at +0.5 or above, whereas CTL2 produced ratios of –0.3 or below. The most salient features of each of the CTL course discussions is given in Table 2 below. (It should be noted that Table 2 simply lists those features which tended to be marked and re-occur; as such it is a gross simplification, but a telling one nonetheless.)

CTL 1	CTL 2
+ New problem related information	- Repeating what has been said
+ New ideas for discussion	- Accepting first offered solution
+ New solutions to problem	- Dragged into the discussion by Tutor
- Squashing, putting down new ideas	+ Refer to course material
+ Learner (student) brings new things in	- Uncritical acceptance
+ Drawing on personal experience	- Repeating information without making inferences or offering and interpretation
+ Use of relevant outside experience	- Offers judgements or solutions without explanations or justifications
+ Critical assessment/evaluation of own or other's contributions	- Stating that one shares the ideas or opinions stated, without taking these further or adding personal comments
+ Discuss ambiguities to clear them up	- Continue to ignore ambiguities

Table 2: CTL1/2 Course — Comparisons of the Discussions' Critical Thinking Content (after Newman et al., 1995)

Analysis of interviews and contributions suggests that differences in the dialogue generated were due to two principal factors:

a) differences in student population between CTL1 and CTL2

b) differences in 'discourse rules' for managing the flow of the discussion.

If the differences were due primarily to a change in student population, then this will always be the case with courses that last for a number of years and have new intakes of students. We still need to find ways to encourage different groups of students into active and reflective discussions despite population differences, a topic which has not been adequately addressed by other CMC research. But if, as we suspect, the differences in the discussion produced are more due to discourse rules, then models of discourse must be better tuned to account specifically for educational discourse as opposed to everyday conversation. We turn, therefore, to a consideration of the nature of educational dialogue and its relation to the CMC environment.

Dialogue in computer-mediated education

Achieving a good dialogue is not just a concern in computer-based discussion. 'Real world' data show that teachers rarely ask real questions, they merely elicit particular responses from students (Barnes, 1971; Sinclair and Coulthard, 1992). The dialogue is not about finding out the students' particular opinions on the topic at hand, nor in general about negotiating an understanding. The objective is to check whether the student has taken on board the understanding (as defined in terms of responses to particular questions) that is prescribed by the teacher or the curriculum. Studies show that children become schooled in the rules of this discourse structure within the first six months of entering school (Willes, 1981). The effect of tutors and students following these discourse rules are that student initiated discussion is rare even at the higher levels of education where negotiation and discussion are explicit desiderata (Phillips and Pease, 1987; Graddol, 1989).

How then do we encourage student discussion? Research on non-computer-based discussion and seminar groups has shown that the same problems now being discussed by the CMC community have a long and honourable history in pedagogical research (Bligh, 1986; Gibbs, 1992). The recommendations made by these researchers should now be taken seriously and communications tools with greater sensitivity to the psychological and emotional nature of educational discourse be developed. This much is argued for by ball-Robeach and De Fleur (cited in Mason and Welton, 1986) when they describe the outcomes of communication as consisting of three central components: cognitive, behavioural and affective. Researchers concerned with the learning outcomes of the application of technology to education tend to concentrate on the first two factors while ignoring the latter; our findings suggest that the three are inseparable.

It is a commonplace, enshrined in many manuals for tutors, that discussion in tutorial groups is difficult to initiate and sustain (Cahn, 1986; Nunan, 1989; Renwick, 1996). Various reasons are proposed for this, often that the groups are too large, the students demotivated. On closer inspection, however, it often turns out that discussion remains hard to sustain with smaller groups, and with well-motivated students. The students still expect to be told more than they expect to discuss, and seek only definitive answers to those questions that they do raise. Our view is that the students are suffering from the effects of long conditioning into the role of answering the teacher's questions, seeking only sufficient information to allow them to do this in the "correct" way not because they are not interested in the topic, but because they have been taught that this is how the educational process works and that this is the role of dialogue in it (Gibbs, 1992). The tutor is therefore faced with the truly enormous task of re-educating the students in the techniques of learning — reconditioning them to respond in quite different ways to radically changed expectations.

We have to overcome the effects of the discursive inertia produced in attempting to change traditional (and hence comforting) discourse patterns, while not undermining either the tutor's or student's roles (though the tutor may have to give up some of the traditional authority associated with the position of the teacher). Further, our model of discourse indicates that the unique character of educational dialogue is aimed at revealing the hidden structure of domain knowledge and reasoning and that discussion can be made more effective by the better use of modelling by the tutor of desired discourse and by explicitly varying the roles of the students and tutors (McKendree et al., 1997).

Commonly, in the context of CMC, CSCL and language analysis, the role of computing technology in education is seen either as being to assist tutors in maintaining traditional discourse patterns (e.g. Laurillard, 1993; Pilkington and Mallen, 1996), or as being to introduce new working and discourse patterns (e.g. Graddol, 1989; Balestri et al., 1992; Mayes, 1995; Sproull and Kiesler, 1993). What underlies both views is an understanding that we remain largely ignorant of what constitutes good educational discourse. It appears from our findings that producing a discussion that is both tutor led and also conducive to 'knowledge-based' questioning may not be possible: these properties may simply not be compatible. Newman et al. (1995) found in their analysis of pedagogical discourse that a single discussion tends to lend itself either to the production of creativity or to the logical linking of concepts. Similarly, Pilkington and Mallen (1996) found comparable differences in dialogues between

peers and those between tutor and student. The findings here demonstrate that very different learning outcomes are produced when such differences in discourse rules and interaction patterns are adopted (see also Phillips and Pease, 1987).

We accordingly diagnose the problems in CTL2, described above, as being due to our having actually changed the dialogue structuring so as to have particularly supported the traditional pattern of student/tutor discourse. The provision of specific questions to be addressed; the role of the tutor as summariser and, hence, ultimate arbitrator; the more rigid association between discussion and curriculum — all these things tend to encourage the students' already strong tendency to assume that free-ranging, exploratory and perhaps challenging or iconoclastic discussion would be somehow, even if seen as attractive, not quite appropriate.

This view of the situation is also interesting in relation to the reported attitudes of the students. In CTL2 students found the discussions to be, as noted above, less than engaging; a chore to be completed because it was demanded. These students, however, were in the position of being able also to meet and discuss informally, outside the classroom, and outside the framework provided by HyperNews. It appears that they found this useful, as suggested by some of their comments:

> *It didn't make me feel more involved, because we are meeting in the lab., not just in the HyperNews discussion... but things were being discussed anyway... Maybe if we were just meeting once a month that would make a difference."*
>
> *"What tended to happen... a lot of discussion problems, areas of interest, was done in the break in the lessons, not on HyperNews. When you're off-line and face-to-face with a human you're happy to talk about interests and problems. Group work was successful because of this. If people have a problem people can be more open in groups and feedback is immediate...."*

One might speculate that students who were more cut off from each other, and for whom CMC provided the only real means of contact, would find it more useful for pursuing less formal types of discussions. HyperNews, being relatively unstructured in the way discussions can develop, would easily allow students in such a situation to develop their own "areas" (discussion threads) where they could interact "off-topic", out of the context of that week's particular focal issue, and we might expect increased use of such options by more isolated students.

We also speculate that the very lack of structure imposed by a HyperNews-like tool is an advantage in promoting this more free-ranging discussion, and that a system which sought to offer more elaborate support for structuring might be in this situation restrictive (see also Graddol, 1989). It is important to note, however, that this is not the only kind of dialogue that needs to be supported in the educational process; in the initial approaches to a new topic, for instance, the student will almost certainly benefit from a more structured approach. It would be important to provide a complement of communication tools, some promoting creative peripatetic arguments and others controlled localised analysis of discourse. "Discussion" is not some kind of unitary *task* that suggests a particular kind of interface or support tool (Paulsen, 1995). Rather it is a heterogeneous collection of quite diverse activities with different functions and requirements, depending on many complex features of the learning situation and the experience and expertise of the participants (Goffman, 1981; Lipman, 1991; Edwards and Potter, 1993; Graessar and Person, 1994). But it has a dynamic that only in the most clearly defined cases can be accurately modelled, pre-defined or prescribed, and so we believe that the need for flexibility of structure is in most cases paramount.

Here is where we find there is a limit to what the techniques of HCI can contribute to CMC. Though, indeed, it is always easy (and still common) to underestimate the extent to which a system and its interface are dependent on task, social situation, and other aspects of the "embeddedness" of the activity (cf. Norman, 1993), the range of open options is rarely as great as when the central functionality demanding support is *human-human* communication. The latter is so dependent on influences outside the system that the designer often can do little to anticipate structural needs, or to predict the effects of design decisions on the activity. The

system must allow the users to structure *their use of it* to provide what they need (Balestri et al., 1992).

What we need, then, is a model of dialogue that combines some degree of curriculum-directedness, which is after all necessary, with a greater facility for students to explore the issues in a less directed way, allowing the treatment of the tutor more as a peer, though one with a valuable reserve of experience and factual knowledge that can be drawn upon in the interests of furthering *critical* discussion. Perhaps an initially more structured laying out of material will be required, but then it will have to be opened up. *After* this basic attitude or approach to dialogue is safely in place, it may be beneficial to re-introduce structure, e.g. through the use of an argumentation tool such as gIBIS (Conklin and Yakemovic, 1991) or QOC (Meyer, Young, Bellotti and Moran, 1991), where it can be developed under the control of the participants and may indeed emphasise the fact that their dialogue is now employing what has elsewhere been called the discourse of *derivation*, a co-operative development of knowledge between equals, rather than the discourse of *exposition* by the tutor as a figure of authority (McKendree at al., 1997: cf. also Barnes et al., 1971; Pilkington and Mallen, 1996). Again, different tools may be best suited to different stages of this process, or to different specific situations of these kinds.

Task-directed discussion: departing from exposition

Our strategy now is to investigate what we can do to promote a more probing discussion at an earlier stage. This, we think, is best approached by developing a structure for discourse which initially leads the participant relatively firmly in the direction of raising questions and re-examining issues.

We are developing a series of Task Directed Discussion games (TDDs) which encourage students quickly to engage in meaningful discussions early in a course. These games gradually demand more and more deep thinking about the domain and 'ease students in' to discussions. These TDDs are a first step both toward developing methods which will be useful for any student population and also toward testing and refining our model of educational dialogues. We are also looking at ways to incorporate these TDDs in on-line discussions.

All task-directed discussions are based on the idea of eliciting discussions from students by providing them with a common focus. The common focus in all cases being a finite set of key concepts or elements (or 'syntagms'), taken from the course content, that students must structure in various ways. To date eleven task-directed discussion games have been localised, each demanding a different structuring of the key elements. The important principle for all tasks is that through relating the elements to one another on a structural basis a learner is encouraged to explore the knowledge domain being studied, whilst providing an explicit representation of their current understanding of that knowledge domain. These explicit representations of students' inchoate understanding then form the focus of discussions between tutors and students, and amongst peers.

Other areas in which the need for TDDs in educational discourse has been suggested include:

1. Discussion Group Dynamics (e.g. psychology of groups: McGrath, 1984 ; Forsyth, 1983; pedagogical discourse: Bligh, 1986; OECD, 1996; CMC research: Sproull and Kiesler, 1993; Discretionary Databases: Thorn and Connolly, 1987);
2. Analysis of existing pedagogical techniques for Computer-Mediated Communication (a good overview can be found at http://www.hs.nki.no/~morten/cmcped.htm — by Morten Flate Paulsen, 1995);
3. Structuralists', post-structuralists' and super-structuralists' conceptions of paradigmatic and syntagmatic processes of knowledge construction and meaning. Particularly 'Personal Construct Theory' (Kelly, 1955), 'A Theory of Semiotics' (Eco, 1976; 1981), and 'Beyond Superstructuralism' (Harland, 1993);
4. Task based learning methodologies, with particular reference to research and practices in second language acquisition: Ur (1991) and Nunan (1989).

Research on discussion group dynamics, particularly on educational groups, has shown the need to vary both the content, form, size and focus of discussion groups in order to maximise learning effects (where learning effects are understood as defined by Henri, 1991). Similar findings are also beginning to emerge from CMC research, though the field has yet fully to rediscover the findings marked out in the psychology literature on group communication. Where TDDs have gained a great deal is from the lessons learnt in work on second language acquisition. Here there has been over thirty years of work on the embedding of complex cognitive tasks in structured discussion groups (Ur, 1991; Nunan, 1989).

TDDs aim to teach the content of a course through staged discussion tasks. At the beginning the tasks focus on a restricted set of comparisons and manipulations. As the learners progress, more complex and general discussion tasks are introduced. One of the primary motivations for the introduction of staged tasks was the observation that students had difficulty in, and were reluctant to attempt, the articulation of the current state of their understanding of the course content. This difficulty extended not only to course tutors and their peers, but also to themselves (Cahn, 1986). This in itself is not so surprising as it has been a common concern amongst educationalists studying a wide range of discussion groups (Bligh, 1986; OECD, 1996).

The structured discussion task gradually introduces individuals into the process of exposing or making exoteric their conceptions of the course content. One result is intended to be the amelioration of communication difficulties arising from the affective nature of the self-disclosure process that is involved in revealing to others the current state of one's own ignorance, understanding and misunderstandings of the course content.

Equally, a related goal for the TDDs is to exploit what James Britton (1970) called the 'expressive' function of language. That is, the ability to explore new ideas and produce 'tentative first drafts of new ideas' through language, which is missing in the more formal rigour of less relaxed language (Graddol, 1989).

So how do task-directed discussions work? Based on the results of students' conceptualisations of certain key concepts of the course content, the first stage is to begin to locate these key concepts in the course materials. This in itself can form the basis of an important discussion task as students and tutors can argue about the concepts which are most unique or important to the knowledge domain. A long term aim of the discussion tasks is to make exoteric to both tutors and students those ideologies or concepts implicit in their thinking so that these can be explored (Scardamalia and Bereiter, 1991).

Other TDDs are based on providing explicit definitions, descriptions, and examples of the application of these key concepts, or getting students to compare a number of key elements in order to explore similarities and differences in their meaning, scope and application.

The ideas behind TDDs are perhaps best illustrated with some simple examples. On the CTL course some of the key concepts included: peer tutoring, dialogue, constructivism, feedback, instructivism, procedural knowledge, declarative knowledge, structuring, accretion, tuning, reflection, exploration, scaffolding, schemata …

Using these concepts, learners are asked to become involved in simple tasks to help reveal their understanding of them. Such TDDs include :

- Scanning TDD : choose three factors that are most important in …;
- Ranking TDD : rank given concepts on level of importance to …;
- Defining Terms TDD : one student describes a concept, the other must guess what concept they are trying to describe;
- Comparison TDD : describe the connection between two concepts;
- Repertory Grid TDD : select three concepts and describe in what way two are similar, but different from the other one;

- Common Denominator TDD : given a concept name examples of its application.

After having completed their manipulation of these key elements, students are then required to engage in discussions that compare their own descriptions of the key concepts with those of their peers, the tutors and those presented in the course content.

Conclusions

The course content for the CTL courses may be characterised as being : (i) largely text based, with case studies; (ii) discursive, such that interpretations of the domain's central concepts are open to debate; (iii) synthetic, i.e. a meeting point for the concerns of many disciplines; (iv) constructive, in that abstract concepts are partially exemplified by working models and systems, some of which students will attempt to construct; and (v) human centred, in that it invites self-reflection on one's own experiences.

Such properties make the domain ideal for the application of structured discussion tasks like task-directed discussions. Given the simple building blocks underlying each TDD and the ability to define the nature of interaction and discourse that takes place during such discussion tasks, the suggestion is that CMC tools may be developed that will allow effective presentation of these tasks to learners.

The objective here is to provide a clearer basis for making the distinctions that we have found need to be made in approaching the question of how interface issues bear on the support of educational dialogue. We have to tease apart the tangled issues of learning task, dialogue situation, motivation and affect, before we can describe more clearly how the design of any particular tool is contributing to the overall patterns of dialogue that result. There are of course many subtleties in dialogue: we are alive, for example, to the issue of how feedback conditions the effectiveness of dialogues (cf. Pilkington and Mallen, 1996), and to the likelihood that some of these factors may well differ between TDD types, and between subject domains where the same TDD type is applied. However, we anticipate that we will have to work at a level somewhat higher than this, and will hence be best served by tools allowing presentation of TDDs as types of generic structure, modulating domain information, with explicit support for the different task emphases at the initial stage and a more open framework available for subsequent development of discussion.

In general terms we hope this will contribute to addressing the problem, faced on all sides, of how to support the development of dialogue in Computer Mediated Communication for Learning (CSCL); and in the context of the *Vicarious Learner* project it will have great value in helping us to specify the nature of captured dialogues and relate them to situations in which re-use may be appropriate.

Acknowledgements

Some of the research reported here is carried out in the Human Communication Research Centre (HCRC), an interdisciplinary research centre of the UK Economic and Social Research Council (ESRC). The *Vicarious Learner* project is funded by the ESRC Cognitive Engineering Programme, and the EPSRC Multimedia and Networking Applications Programme. Other members of the project are J Terry Mayes, Keith Stenning, Richard Cox, Jonathan Kilgour and Richard Tobin.

References

Adelman, C. (1981). *Uttering, Muttering: Collecting, Using and Reporting Talk for Social and Educational Research*, London: Grant McIntyre Ltd.

Antaki, C. (1994). *Explaining and Arguing: The Social Organisation of Accounts*, London: Sage Publications.

Balestri, D. P., Ehrmann, S. C. and Ferguson D. L. (1992). *Learning to Design, Designing to Learn: Using Technology to Transform the Curriculum,* New York and London: Taylor and Francis.

Barnes, D., Britton, J. and Rosen, H. (1971). *Language, the Learner and the School*, Harmondsworth: Penguin Books Ltd.

Bligh, D. (Ed.) (1986). *Teach Thinking by Discussion,* Surrey: SHRE & NFER-NELSON.

Britton, J. (1970). *Language and Learning*, London: Penguin.

Cahn, M. (1986). *The Development of Trust in Learning Groups*, In D. Bligh, (Ed.), *Teach Thinking by Discussion,* Surrey: SHRE & NFER-NELSON

Conklin, E.J. and Burgess Yakemovic, KC. (1991). A process-oriented approach to design rationale. *Human Computer Interaction,* Vol 6, pp. 357-391.

Connelly,T., and Thorn, B.K. (1991) Discretionary Databases: Theory, data, and implications. In J. Fulk and C.Steinfield (Eds.), *Organizations and Communication Technology*, Newbury Park, CA: Sage, pp.219-233.

Eco, U. (1976). *A Theory of Semiotics*, Bloomington: Indiana University Press.

Edwards, D. and Potter, J. (1993). *Discursive Psychology*, London: Sage.

Forsyth, D. R. (1983). *An introduction to Group Dynamics*, Monterey, CA: Brooks/Cole Publishing Co.

Gibbs, G. (1992). *Discussion with More Students*, Cambridge: Oxonian Rewley Press.

Goffman, E. (1981). *Forms of Talk*, Oxford: Blackwell Publishers Ltd.

Graddol, D. (1989). Some CMC Discourse Properties and their Educational Significance. In *Mindweave: Communication, Computers and Distance Education*, R. Mason and A Kaye, (Eds). Oxford: Pergamon Press.

Graessar, A. C. and Person, N. K. (1994). Question asking During Tutoring, *American Educational Research Journal*, 31, 1, pp. 104-137.

Harland, R. (1993). *Beyond Superstructuralism*, London: Routledge Press.

Henri, F. (1991). Computer Conferencing and Content Analysis. In O'Malley, C (Ed.), *Computer Supported Collaborative Learning*, Heidelberg: Springer-Verlag.

Kelly, G.A. (1955). *The Psychology of Personal Constructs*, New York: Heinemann.

LaLiberte, D. (1995). HyperNews, http://union.ncsa.uiuc.edu:80/HyperNews/get/hypernews.html

Laurillard, D. (1993). *Rethinking University Education*, London: Routledge.

Lipman, M. (1991). *Thinking in Education*, Cambridge: Cambridge University Press.

Mason, R. (1991). Methodologies for Evaluating Applications of Computer Conferencing. In Kaye, A.R. (ed.) *Collaborative Learning through Computer Conferencing*, Heidelberg: Verlag-Springer.

Mayes, J.T. (1995). Learning Technology and Groundhog Day. In Strong, W., Simpson, V.B., and Slater, D. (Eds.) *Proceedings of Hypermedia at Work: Practice and Theory in Higher Education*, Canterbury: University of Kent at Canterbury.

McGrath, J.E. (1984). *Groups: Interaction and performance*, Englewood Cliffs, NJ: Prentice-Hall.

McKendree, J., Stenning, K., Mayes, T., Lee J., and Cox, R. (1997, in press). Why Observing a Dialogue may Benefit Learning: The Vicarious Learner. *Proceedings of PEG'97*, and to appear in *Journal of Computer Assisted Learning*, June 1998.

Meyer, B. J. F., Young, R. M., Bellotti, V., and Moran, T. (1991). Questions, Options and Criteria: Elements of design space analysis. *Human Computer Interaction*, 6(3&4), pp. 201-250.

Morgan, J. and Welton, P. (1986). *See What I Mean: An Introduction to Visual Communication*, London: Edward Arnold.

Newman, D. R., Webb, B. and Cochrane, C. (1995). A Content Analysis Method to Measure Critical Thinking in Face-to-Face and Computer Supported Group Learning, *International Computing*

and Technology: An electronic Journal for the 21st Century, ISSN : 1064-4326, April, Volume 3, Number 2, pp 56-77.

Norman, D. A. (1993) *Things That Make Us Smart.* New York: Addison-Wesley.

Nunan, D. (1989). *Designing Tasks for the Communicative Classroom*, Cambridge University Press, Cambridge

OECD Proceedings (1996). *Adult Learning in a New Technological Era*, OECD: Centre for Educational Research and Innovation, Paris.

Ohlsson, S. (1995). Learning to do and learning to understand: A lesson and a challenge for cognitive modeling, In Reimann, P. and Spada, H. (Eds). *Learning in Humans and Machines: Towards an interdisciplinary learning science,* Oxford: Elsevier Science, pp.37-62.

Osgood and Shram, (1954). *The Process and Effects of Mass Communication*, Bloomington: University of Illinois Press.

Paulsen, M. F. (1995). Pedagogical Techniques for Computer-Mediated Communication, http://www.hs.nki.no/~morten/cmcped.htm

Phillips, A.F. and Pease, P.S. (1987). Computer conferencing and education: complementary or contradictory concepts?, *American Journal of Distance Education,* Vol.1, No.2, pp. 44-52.

Pilkington, R. (1996). Interacting with computer-based simulation: the role of dialogue, *Computers and Education*, Vol. 27, No. 1, pp. 1-14.

Pilkington, R. and Mallen, C. (1996). Dialogue Games to Support Reasoning and Reflection in Diagnostic Tasks, *Proceedings of EuroAIED,* Lisbon: Edições Colibri, pp. 213-219.

Renwick, W. (1996). The future of Face-to-Face and Distance Technology in Post-Secondary Education, *Informative Technology and the Future of Post Secondary Education*, OECD: Paris.

Rosenshine, B. and Chapman, S. H. (1990). Teaching Students to Generate Questions: A Review of Teaching Methods, School of Education Technical Report, Champaign, IL: University of Illinois.

Scardamalia, M. and Bereiter, C. (1991). Higher Levels of Agency for Children in Knowledge Building: A Challenge for the design of New Knowledge Media, *Journal of the Learning Sciences*, 1, pp. 37-68.

Scardamalia, M., Bereiter, C., Brett, C., Burtis, P. J., Calhoun, C., and Smith-Lea, N. (1992). Educational Applications of a Networked Communal Database, *Interactive Learning Environments*, Vol 2, No. 1, pp. 47-71.

Sinclair, J. and Coulthard, M. (1992). Towards an Analysis of Discourse, In M. Coulthard (ed.) *Advances: Spoken Discourse Analysis*, London : Routledge, pp. 1-34.

Sproull, L. and Kiesler, S. (1993). Connections: New Ways of Working in the Networked Organisation, 3rd Edition, London: MIT Press. ISBN : 0-262-19306-X

Ur, P. (1991). *Discussions that Work: Task-centred fluency practice*, Cambridge: Cambridge University Press, ISBN : 0-521-28169-5.

Voss, J. F. (1990). Reasoning by argumentation. In H. Mandl, E. De Corte, N. Bennett, & H.F. Friedrich (Eds.), *Learning and instruction: European research in an international context,* Vol. 2.1, Oxford: Pergamon Press, pp. 305-319.

Willes, M. (1981). Children Becoming Pupils : A Study of Discourse in Nursery and Reception Classes, In Adelman, C. (Ed). *Uttering, Muttering: Collecting, Using and Reporting Talk for Social and Educational Research*, London: Grant McIntyre Ltd.